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THE ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO. A CENTER OF RESEARCH, INVESTIGATION AND TRAINING TO ASSIST STATES AND COMMUNITIES IN SOLVING PROBLEMS OF AIR, WATER AND FOOD CONTAMINATION

Public Health Service
Washington, D. C.

1954

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The Robert A. Taft
SANITARY ENGINEERING CENTER

Cincinnati, Ohio

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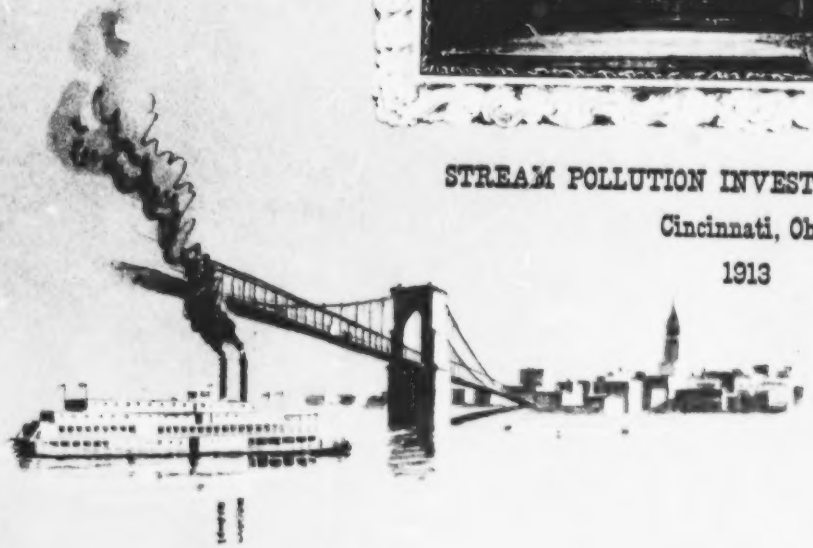
U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

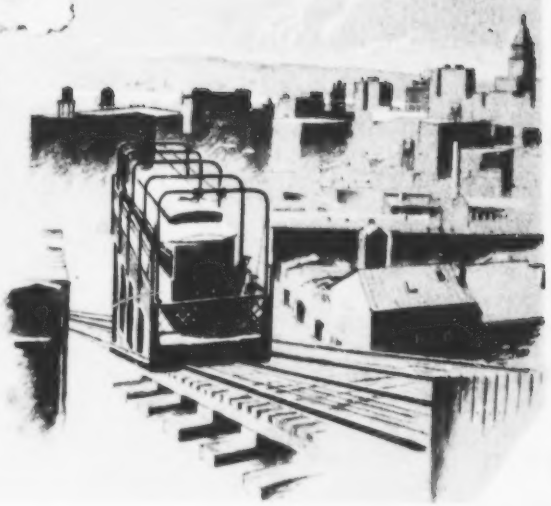
Public Health Service
Bureau of State Services

STREAM POLLUTION INVESTIGATIONS STATION

Cincinnati, Ohio

1913





The Robert A. Taft
SANITARY ENGINEERING CENTER

A center of research, investigation and training to assist States and communities in solving problems of air, water and food contamination.

The new sanitary engineering laboratory at Cincinnati . . . will make possible a vigorous attack on health problems associated with the rapid technological advances in industry and agriculture.

President Dwight D. Eisenhower

Message to Congress on the Health of
the American People, January 18, 1954

THE SANITARY ENGINEERING CENTER

The substances which support our lives—the air we breathe, the water we drink, the food we eat—must be kept safe. All of them carry impurities which may threaten our health. Protecting them against contamination is the task of the sanitary sciences. This task requires effective control measures, based on exact scientific knowledge and sound engineering practices.

State and local health departments across the Nation are chiefly responsible for applying these controls. They are our front line of defense against disease-producing organisms, poisonous or irritating chemicals, uncontrolled ionizing radiations, and other kinds of contamination. The Federal government, primarily through the Public Health Service of the Department of Health, Education, and Welfare, assists by studying and evaluating health hazards, exploring new or better ways of dealing with them, and passing along the results of these explorations to the people who can use them. The Sanitary Engineering Center at Cincinnati is headquarters for this Federal program of research, field investigation and training.

THE CHALLENGE OF THE PRESENT

The population of the United States has doubled in fifty years. Our urban population has tripled. Our industrial output has increased seven-fold. Such growth makes new demands on our environment. Sometimes the environment itself is changed, as when new chemicals or radioactive materials are added to air and water. New health problems arise, and these, coupled with still unanswered questions from the past, make up the present and future challenge to the sanitary sciences.

For instance, in the area of public water supply, more people than ever before must be furnished drinking water that is both safe and palatable. Thanks to the work of pioneer physicians, sanitary engineers and scientists, typhoid fever and other bacterial waterborne diseases of old have almost disappeared in the United States. But the role of water as a carrier of virus diseases is not fully understood. We know relatively little about the effect on health of the enormous variety of chemicals discharged to our waterways by industry. Control of tastes and odors in drinking water demands further investigation and research.

More people and bigger industry mean more potential waste discharges to our lakes and streams. The increasing pollution of our natural waters causes problems in addition to those directly related to drinking water supply. Our growing industrial machine requires ever-increasing quantities of water, much of which must be of high quality. Farmers must have clean water for stock-watering and irrigation. Outdoor recreation calls for lakes and rivers of suitable quality to support sport fishing, boating and swimming. We must continue to learn more about the effect of domestic and industrial wastes on our waters, and improved methods of dealing with those wastes.

Air, like water, becomes increasingly polluted as cities and industries grow, and we can no longer avoid the problem this creates. Recent disasters in Donora, Pa., in London, and in the Meuse Valley have proved dramatically that air pollution can be a menace to health as well as a nuisance and a costly economic problem. A week of acute air pollution in London in December 1952, resulted in 4,000

more deaths than were normally expected for the period. Presently known analytical methods have not been adequate to determine the precise cause of these deaths. But these acute episodes are only highlights in a picture that is becoming more and more generalized. Chemicals in air produce irritations of the eyes, nose and throat, and allergens including pollens bring discomfort to millions. Both problems are well recognized but as yet uncontrolled.

Outbreaks of food poisoning are on the increase, chiefly because of our changing patterns of living. Faster methods of identifying contaminated food, now being investigated, may spare many people acute discomfort or even death. New processes for disinfecting restaurant and dairy equipment must be evaluated. Milk and shellfish sanitation practices require continuing study.

The atomic age has brought a host of new health problems. Radioactive wastes must be disposed of, safely and surely. We need to find out now successfully our current water treatment and waste treatment practices protect us against radioactive substances. Air pollution by radioactive materials demands study. As the time approaches when nuclear power plants can be set up in many locations from coast to coast, these proble . of safe waste disposal take on nation-wide significance.

This brief brush across the broad picture of the environmental health problems we face indicates the area within which the Sanitary Engineering Center must function. Every segment of the area is affected by the great rapidity of change which has taken place in this country. This breathtaking speed of advance has taken away our cushion of time to ponder trends. Thus the over-all purpose of the Center is reflected in all its activities: to find and evaluate new facts and new or improved methods and techniques, to the end that our health may receive maximum protection with the greatest economy of time, manpower and money. As an important by-product, the work of the Center often stimulates further valuable research and investigation by State or private agencies and institutions.

Stream pollution
Air pollution
Household disposal
Milk and food
Industrial wastes
water purification
Ionizing radiations
RESEARCH
FIELD
INVESTIGATIONS
TRAINING
ENVIRONMENTAL HEALTH RESEARCH
OF THE
U.S. PUBLIC HEALTH SERVICE

History of The Center

In the summer of 1913, a team of physicians, sanitary engineers, chemists, biologists and bacteriologists set up headquarters in the old Kilgour Mansion in Cincinnati. Their job was to study pollution and natural purification of the Ohio River. They were officers of the Public Health Service, operating under a Congressional act of the year before which directed the Service to make "investigations of sewage pollution as it related to the diseases of man."

From these beginnings as the Stream Pollution Investigations Station, the Cincinnati laboratory has grown into the Sanitary Engineering Center of today. Although two World Wars called many public health officers from the Station to more urgent duties directly concerned with the war effort, and the 1930's also saw deep inroads in staff and functions, each decade has produced important contributions to our health knowledge.

When the Station began work in 1913, very little was known about the chemistry, biology and physics of a polluted stream. No one knew precisely how to measure pollution damages. The scientists had to collect their data and develop their methods and techniques as they went along. The Kilgour Mansion, which had been abandoned when the Service's scientists moved into it, was anything but an ideal laboratory. But by the time the Ohio River Survey and a companion study of the Illinois River were completed in the early 1920's, these men had developed the application of two fundamental measures of pollution in a stream: the coliform bacteria index and the biochemical oxygen demand test. They formulated the principles of self-purification in streams and laid much of the groundwork for future pollution investigations.

Research on water purification during the 1920's established criteria for determining whether or not a certain stream or lake was safe as a source of public water supply, and how much treatment its water should receive. State and local health officials and consulting engineers still use these raw water quality guides in choosing sources of water and designing purification works. Important improvements in design and operation of sewage treatment plants also grew out of the Station's studies during the '20's and '30's. From 1939 to 1941, a second survey of the Ohio River was made to evaluate pollution control requirements of the entire river system.

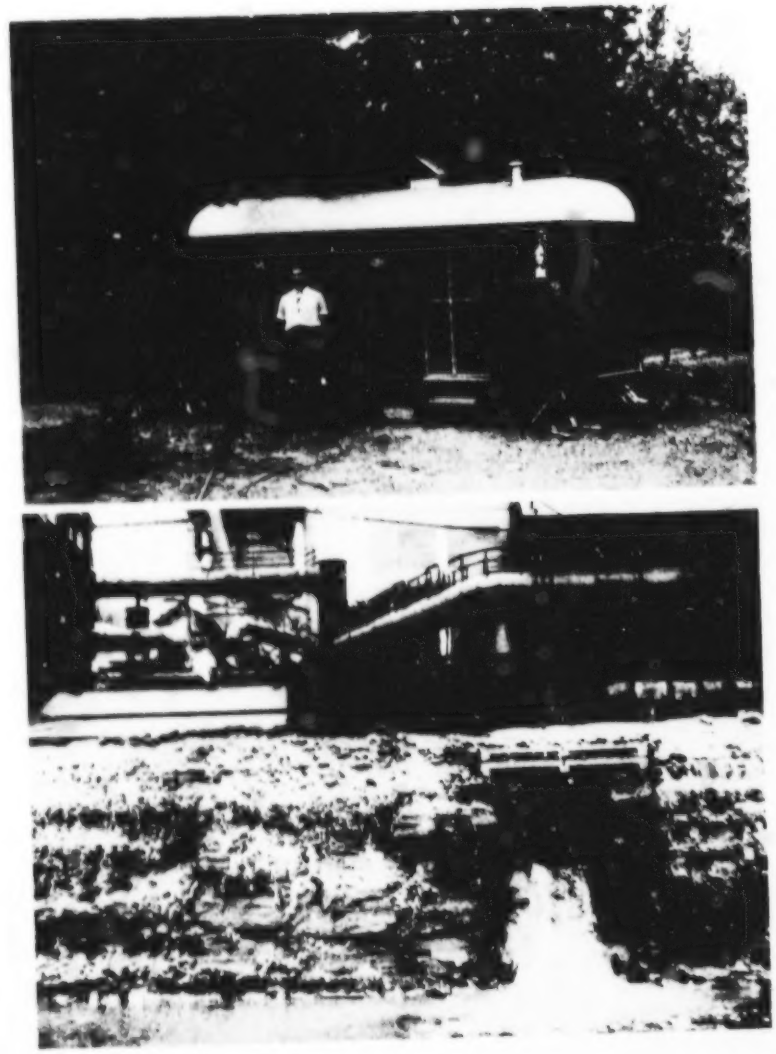
The milk and food sanitation work of the Public Health Service helped to establish high standards of laboratory inspection in State and local health units, thus adding to the health protection of many millions of people.

The Kiski, a Corps of Engineers quarterboat, was converted into a floating mobile laboratory by the Public Health Service. It was used for physical, chemical, and bacteriological analyses in the pollution survey of the entire Ohio River system carried out in 1939 and 1940.

During World War II, the Station made important contributions to the war effort. Its reduced staff studied rapid, simple methods for detecting war gases in water and foods. They tested the effects of various munitions wastes on streams and sought means for treatment and disposal of these wastes. They investigated methods of water disinfection for military field operations. In addition, the Station operated nine mobile laboratory units, working with State and local health authorities on matters of water, milk and restaurant sanitation in areas around military cantonments.

In 1948, the Station was reorganized as the Environmental Health Center. The Water Pollution Control Act of that year extended Public Health Service activities to include protection of the habitats of fish and aquatic life and other newer aspects of waste disposal and pollution control. Cooperation with the Atomic Energy Commission on health problems related to ionizing radiations was begun in 1948. Air pollution control investigations were begun by the Center in 1953. Meanwhile, survey and research work continued and expanded along the lines pioneered by the earlier activities of the Station.

The new Sanitary Engineering Center, only a few miles from the original laboratories in the Kilgour Mansion, contains facilities of which the pioneer engineers and scientists would have been proud. It symbolizes the development of a public consciousness—that all environmental factors influencing man's health must be studied, evaluated and controlled.



Above: Trailer laboratory used on the earlier field studies.

Below: Industrial waste outfalls like this one contributed to the pollutional conditions investigated by the Stream Pollution Investigation Station throughout its history.

Activities of The Center

The problems chosen for study at the Sanitary Engineering Center are, first of all, practical problems—those confronting health workers in the field. The Center consults with State Health departments, industries, other Federal agencies and branches of the Public Health Service, to determine what needs to be done and how soon. The Center's scientists propose projects stemming from new developments in their individual fields. Requests for aid come in from many sources. Each is carefully evaluated. In general, those problems are selected which have a broad interest and many applications. Further, each problem must offer a reasonable expectation of success, or at least a promising avenue of approach.

The Center's specialists function as a team on the problems selected. Some projects are primarily field investigations, surveys of existing conditions. Others depend chiefly on laboratory research. But there is no sharp dividing line; many field surveys require intensive laboratory work, and many research projects require data from field investigations. Some problems are concerned with developing improved methods and techniques, while others involve the discovery of new facts, but here again there is close interplay; progress in one may produce results in the other.

In the following discussion of current activities at the Sanitary Engineering Center, the projects have been grouped under six headings: water supply, water pollution, wastes, food, air pollution, and technical services. Of necessity, many studies have been omitted or lightly touched upon. Those described are intended to represent the types of work undertaken by the Center and to indicate the kinds of results expected.

The membrane filter allows rapid, accurate counting and identification of bacteria in water. Water poured in at the top passes through the filter. Bacteria are caught by the filter, which is then removed and placed on a pad of nutrient material so that the bacteria may develop into colonies.

DRINKING WATER SUPPLY

Bacterial Studies

There has long been a need for a quicker and more accurate and dependable means of estimating the bacterial content of water. Present methods used in the bacteriological examination of water require 48 to 96 hours. Bacteriologists at the Center, using the membrane filter, have developed a technique which requires only 16 to 18 hours. The speed and simplicity of this technique will assure better sanitary control of water quality.

The additional use of the membrane filter to determine the presence of particular disease-producing organisms, such as those causing dysentery and typhoid, is also being explored. Meanwhile, scientists are investigating an even quicker method for identifying bacteria by means of the infrared spectrophotometer.

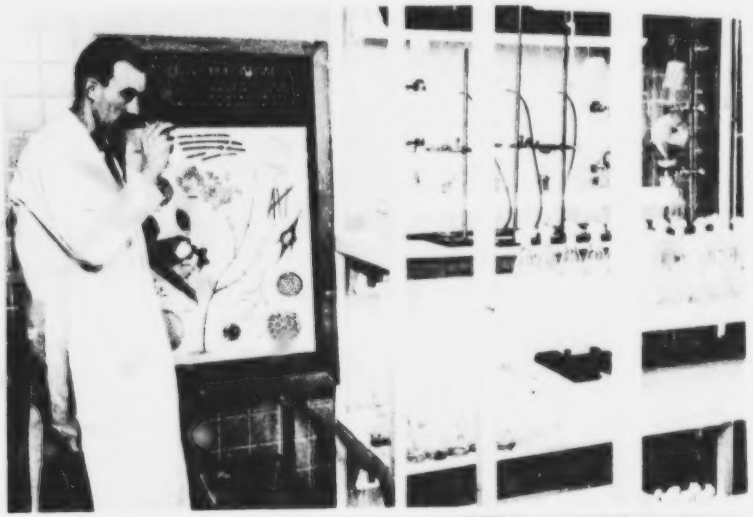
Studies of Viruses and Fungi

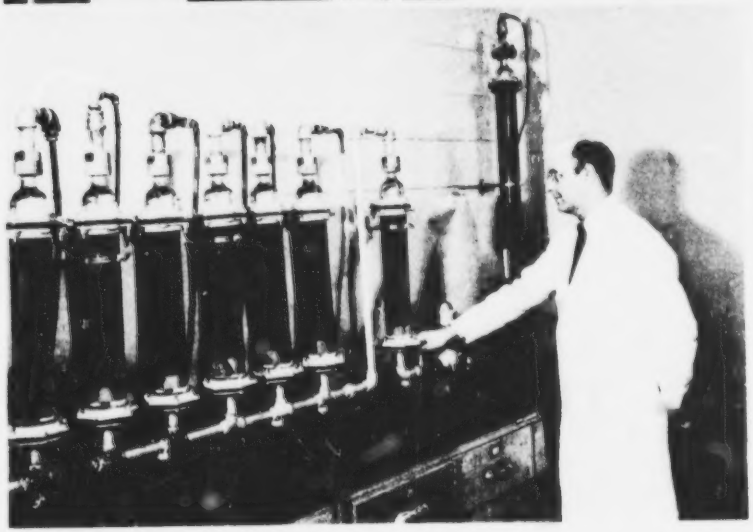
Since 1950 the Center has been studying the role of water in the transmission of virus and fungus diseases. Under what conditions do viruses and fungi occur and survive in water? How can they best be identified and counted? How effective are chlorination and other purification processes in destroying such viruses as the agent of infectious hepatitis?

The virus of infectious hepatitis has never been cultivated suc-

Above: After incubation, each organism trapped on the filter grows into a visible colony. These can be counted to determine the number of bacteria in the original water sample.

Below: Highly infectious viruses must be handled under specially designed safety hoods. The virologist is inoculating an infectious virus into fertile eggs in which it will multiply.





cessfully in any animal but man. Virologists at the Center are investigating the possibility of growing it in tissue cultures, so that studies may be made of the effectiveness of purification practices in the removal of viruses from water. They are studying the presence and survival in water of the coxsackie viruses, which are similar in some ways to the polio virus. Viruses, which are present in sewage, have been shown to survive in water for as long as 200 days.

Tastes and Odors

Tastes and odors in drinking water may be caused by a wide variety of chemicals and by many microscopic plant and animal forms. Both chemical and biological aspects are being studied at the Center. Biologists are developing ways of isolating and growing different types of algae in the laboratory. They are studying the food requirements of various species, and investigating ways of destroying or controlling harmful types. They are also preparing accurate drawings of various algae, to help water treatment plant operators to identify those which cause taste, odor, and filter clogging problems.

With some chemicals only a few parts per billion parts of water are enough to cause tastes and odors in a water supply. Materials

Above: Growths of algae in water may cause taste and odor problems. Single species of algae are being isolated and cultivated in the laboratory in order to develop new and improved control methods.

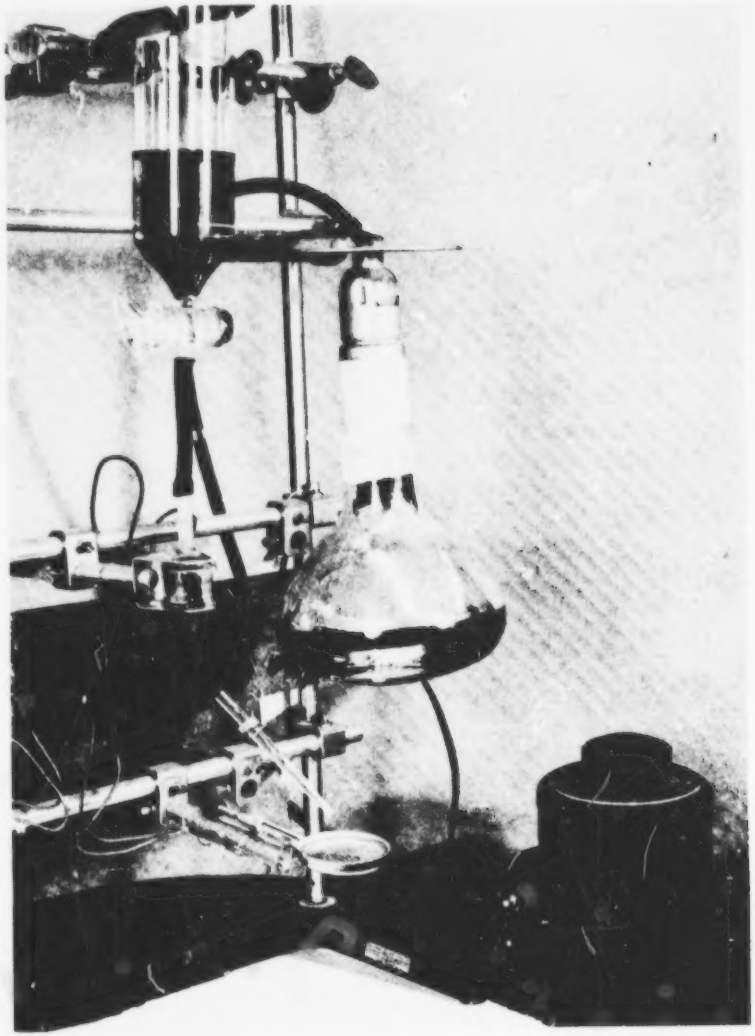
Below: Carbon filters are used to concentrate minute quantities of organic materials from water. Such materials, which often cause taste and odor problems in water supplies, may be identified by analyzing the concentrates.

present in such tiny amounts are difficult to identify and remove. The Center's chemists are currently studying such substances contributed to streams and lakes by various industries, and in agricultural insecticides which reach streams via drainage from the land. They have developed a way of concentrating these materials, using a type of carbon filter. The substances are then analyzed, to identify specific materials causing tastes and odors. Conventional organic separations, as well as infrared spectroscopy and chromatography processes are used in the analyses.

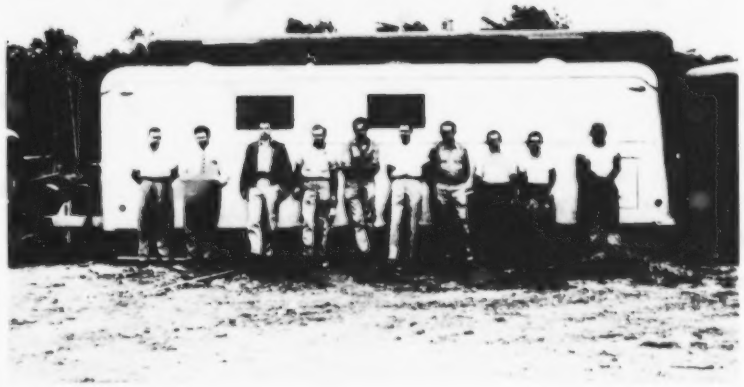
These studies, like many others at the Center, yield both new information and improved methods. The concentration techniques provide a useful tool which is already being adopted by industry in the study of wastes.

Radioactivity in Water

Scientists from the Center have been working intensively at the Oak Ridge National Laboratory and elsewhere on ways of removing radioactive materials from water supplies. They have completed a study of the effectiveness of conventional water treatment processes in removing such materials, and further research is in progress.



This device automatically controls the feeding of a water sample to a small planchet designed to fit radioactivity measuring instruments. Water is evaporated slowly under an infrared lamp, leaving the radioactive material concentrated in the planchet.



WATER POLLUTION

Pollution of water by sewage and industrial wastes creates many problems outside the field of drinking water supply. In the area of health, bathing in polluted water and consumption of raw vegetables grown under polluted water irrigation must be considered. Further, our uses of water for industry, recreation, navigation, agriculture, and the propagation of fish and aquatic life are all impaired or rendered more costly by pollution.

Stream Surveys

The Center has conducted water pollution investigations in cooperation with State, interstate and local agencies and with such Federal agencies as the Corps of Engineers and Bureau of Reclamation over a period of many years. The streams studied recently include the Kansas, Etowah, Arkansas, South Platte, Savannah, Columbia, Roanoke, Scioto, Pearl, and others.

As an illustration, the Center has conducted an extensive study of the Columbia River, where reactor-cooling waters, containing low levels of radioactivity, have been discharged from the Hanford Works of the Atomic Energy Commission for a number of years. The studies were designed to determine the effects of radioactivity on the chemical quality and the aquatic life in the stream. The work extended over a two-year period, and covered a variety of flow conditions during different seasons of the year. A team of engineers, chemists, biologists, and physicists was used on the study.

Above: Water pollution surveys require special equipment and techniques for collecting samples. Here a water sample has been taken for dissolved oxygen, bacteriological, and chemical analyses.

Below: In typical stream surveys and industrial waste studies, a field team consists of engineers, chemists, biologists, and sample collectors, plus representatives of cooperating State agencies and industries. Two of the Center's trailer-mounted laboratories are generally used for analytical work at the site.

Since 1946 the Center has supplied to the International Joint Commission technical consulting services concerning the waters between the United States and Canada. By treaty, these waters must not be polluted on either side of the boundary to an extent injurious to health or property of citizens of the other country. Extensive field investigations have been made of the waters in the Detroit and Niagara Falls areas to determine existing water quality and the extent and sources of pollution on the United States side.

Bathing Waters

To study the effect of pollution on the health of swimmers, scientists from the Center chose three representative locations: Chicago, on the Great Lakes; Dayton, Kentucky, on an inland river; and Westchester County, New York, on coastal waters. Daily water samples were taken and analyzed over a period of weeks; at the same time, a close daily check was made on the health of bathers and their families. Studies such as these furnish a basis for establishing reasonable standards of quality for bathing waters, which may in turn be applied by State and local officials.

Aquatic Life

Some kinds of fish, insects and other aquatic life require clean water; others can tolerate or even thrive on a certain amount of pollution. For this reason, the kinds of life present in a stream may provide a rapid means of assessing the effects of pollution. Further, because some organisms require a certain quality of water during their entire life-span, they may indicate the pollution history of a stream over a period of time. Biologists at the Center are studying various types of aquatic life and evaluating their usefulness as indicators of pollution.

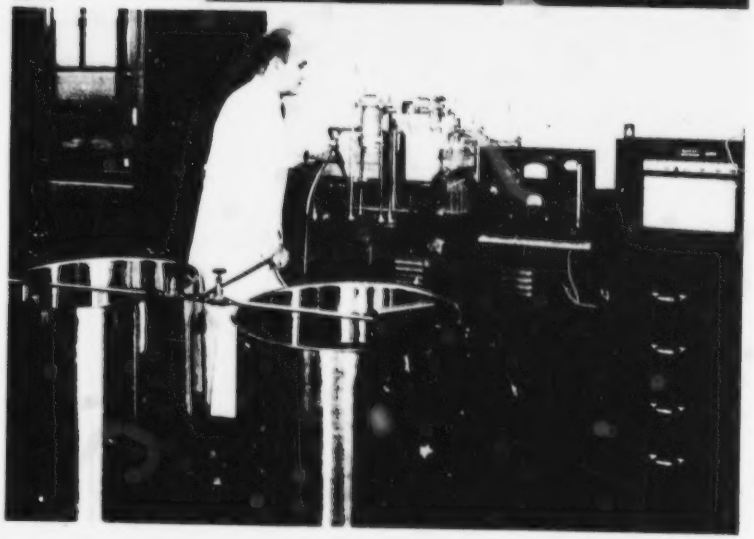
Some chemicals discharged to a stream may kill fish outright. Some are relatively harmless by themselves but lethal when combined with other substances. A biology project at the Center deals with the effect of various heavy metals, cyanides and other toxic

Aquatic biologists at the Center have developed standard procedures for determining the concentrations of various types of pollutants which may be toxic to aquatic life. In these bio-assays, fish are placed in jars containing different concentrations of the test material. The fish are observed over a period of time, and the percentage surviving at each concentration is noted.

substances on fish. These bioassays determine the minimum concentration of each substance which is fatal to fish, and the effects of various combinations of chemicals on fish. Standard bioassay procedures have been developed for application to specific stream studies.

Natural Purification

Making full use of a stream's ability to purify itself may save many dollars in waste disposal costs. To develop further understanding of self-purification processes, the Center is studying the persistence of certain organic substances in water—how long do they last, and how rapidly are they removed or destroyed by natural processes which take place in a stream.



The role of fungi in the natural purification of streams is almost entirely unknown. When the Center began its exploratory research in this field, only a few species were known to be present in surface waters. Many more have now been identified, and research is continuing as to their abundance and the functions they perform in the breakdown of wastes.

The reduction of dissolved oxygen in a stream is an important indication of pollution. Present measurement techniques require frequent sampling at many stations along the river. The Center is developing a portable instrument which will measure and record dissolved oxygen continuously. Such an instrument, urgently needed by water pollution control agencies, would provide information that is difficult or impossible to obtain by other means.

Above: This equipment is used to study the persistence of oils in water. A mixture of oils and water in the carboy is agitated by the recirculating pump. The rate at which the oils decompose is checked periodically by analyzing samples of the mixture and by measuring the gases of decomposition. These gases are absorbed in the liquids in the small bottles.

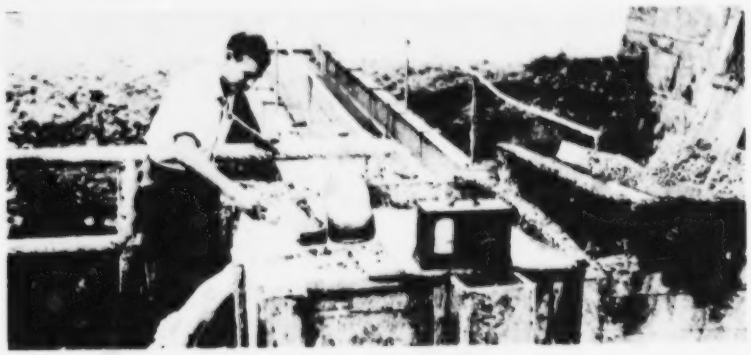
Below: The experimental apparatus shown here is designed to give a continuous record of the dissolved oxygen content of surface waters. It operates by stripping dissolved gases from the water and passing the gases through instruments which automatically determine the oxygen content.

WASTES

Industrial Wastes

Field studies on industrial waste disposal have been undertaken in many industries whose wastes cause significant national or regional problems—beet sugar, steel, pulp and paper, naval stores, petroleum refining, and others. Special attention has been given to pollution abatement measures, including not only waste treatment but also process changes within the plant which reduce quantities or concentrations of wastes. These studies, carried on in close cooperation with State agencies and the industries themselves, have resulted in the preparation of industrial waste guides, useful to industries and pollution control agencies alike.

Research associated with these studies has provided important information related to toxicity problems, by-product recovery and waste treatment processes. The neutral, phenolic basic, and acidic components of various industrial wastes have been estimated for the first time.



Industrial wastes are measured, sampled, and analyzed to obtain basic information on volume, characteristics, and pollutional effect of individual plant process wastes.

Treatment Process Studies

Experimental work is being conducted in the laboratories on chemical and biological treatment of wastes containing hydrocarbons and synthetic detergents. Studies on intensified biological purification are aimed at more rapid treatment and reduction of treatment costs.

The Center investigates the efficiency of important new sewage and waste treatment processes. In a typical study, a field staff of technicians, using a mobile laboratory, examined a new treatment process in use at the Newberry, South Carolina, sewage treatment plant. With full cooperation of the State and City officials, the survey team evaluated the process. Such studies provide reliable information upon which to base decisions involving the choice of treatment processes.

Household Waste Disposal

Residential septic tanks are used by some 17 million people in the United States. The number is growing as more people move to the suburbs, beyond the reach of municipal sewers. Septic tank operations have often been unsatisfactory in various ways. A series of studies begun in 1946 has sought to find out why. Among the factors examined were the efficiency of various tank designs, capacity requirements, need for frost protection measures, and the effect of ground garbage and water softeners on tank operation. The studies also considered the process by which soils absorb the septic tank effluent and the absorption limits of various types of soils.

Radioactive Wastes

Treating and disposing of radioactive wastes to make them harmless is another new and significant field for study. In cooperation with the Atomic Energy Commission, scientists from the Center are working on ways of adapting physical, biological and chemical methods to the treatment and disposal of liquid radioactive wastes; particular attention is being given at present to the absorption of radioactivity in soils.

FOOD

Simple, rapid methods of detecting food contamination are urgently needed. Most food poisoning is caused by toxins produced and excreted by micro-organisms, or by toxic materials resulting from disintegration of the micro-organisms themselves. Current methods for detecting both types of contamination require at least 12 to 18 hours. Scientists at the Sanitary Engineering Center are testing methods which may reduce the time to as little as three hours in both cases. These new techniques may eliminate the process of feeding extracts to animals or humans and waiting for nausea to develop, as is currently done in identifying toxins.

Milk

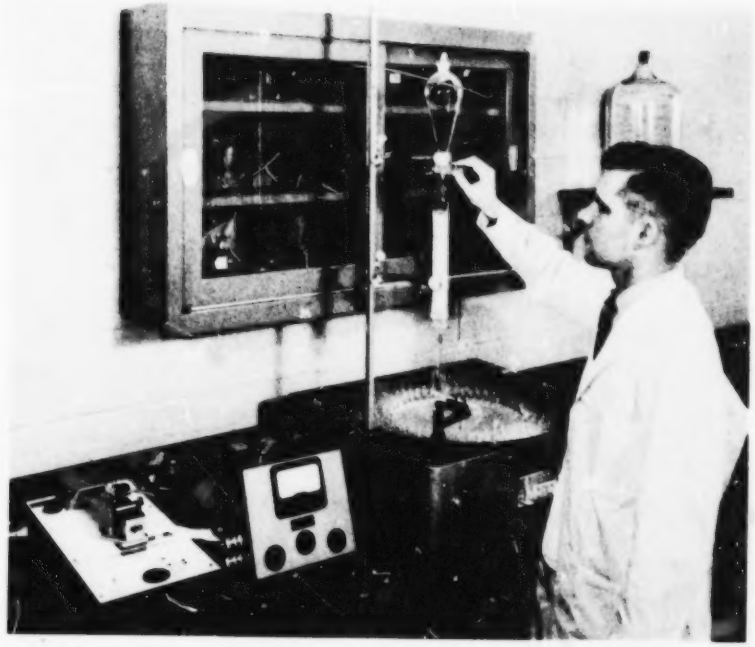
Milk, one of our most valuable foods, requires an elaborate system of safeguards. The Center has worked on improved methods for determining the sanitary quality of milk and the effectiveness of pasteurization. Currently, the Center is studying in a cooperative project with the University of California, the efficiency of commercial pasteurization methods in destroying the organism which causes Q fever.

Shellfish

The Center's Shellfish Sanitation Laboratory is investigating how much contamination shellfish absorb from polluted waters and how well they can cleanse themselves when placed in clean water. The Laboratory which was recently moved from Woods Hole, Massachusetts to Pensacola, Florida, is also evaluating sanitation practices in the commercial harvesting, processing and marketing of shellfish.

Germicides

Studies of new germicides and disinfectants used in the milk and food industry have shown that some function efficiently in certain types of water and are ineffective, and therefore potentially dangerous, in others. Scientists at the Center are continually examining these products so that State and local agencies may have information as to their effectiveness under various conditions.



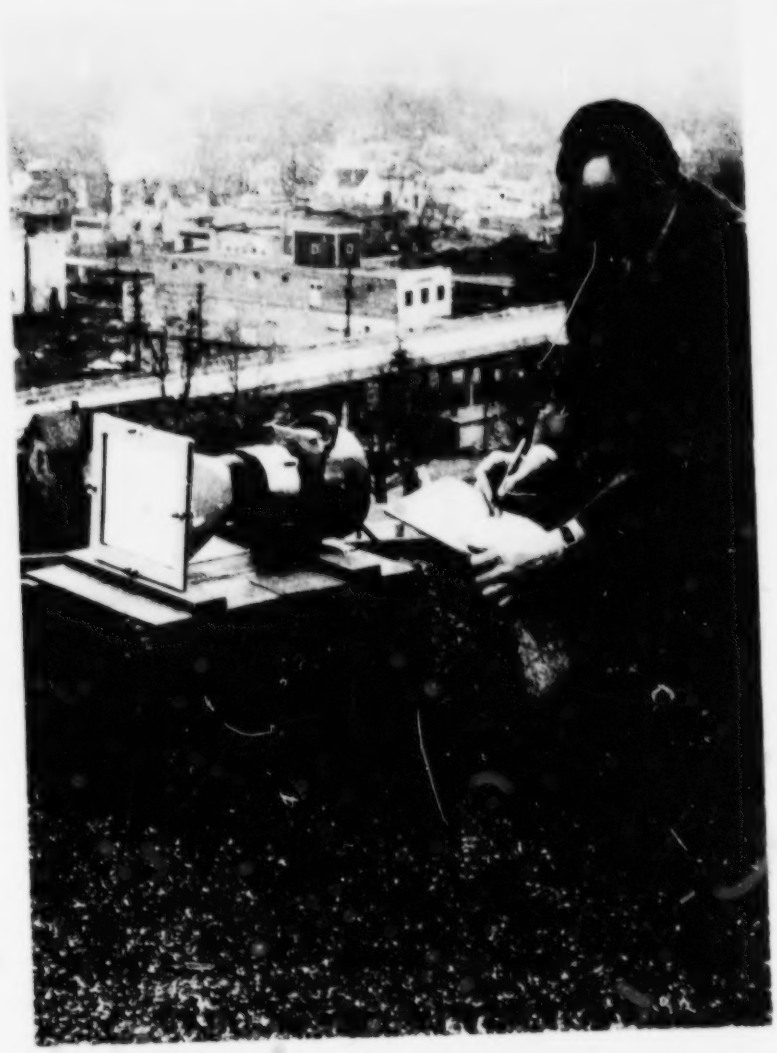
Isolating and identifying bacterial toxins which cause food poisoning is a difficult and time-consuming task. Here, an automatic fractionator is being used to separate a mixture of toxins, in a project to develop more rapid methods for detecting food poisoning.

AIR POLLUTION

The Sanitary Engineering Center has very recently been given a major responsibility for research, survey and training related to the increasing problems of community air pollution. There is much to be learned about the amounts of solid particles, liquid droplets and gases in the air, about the reactions of these substances while floating through the air, and about the damaging effects they produce. And there is a need for adequate tools—sampling and analytical instruments and survey techniques—for investigation of the problems. Furthermore, there is need for understanding of the effects of climate, weather, and geography on the local accumulation of air-borne industrial and domestic wastes. Such knowledge will provide bases for effective control of air quality.

Under the auspices of the International Joint Commission, a study of air pollution has been under way for several years, in the Detroit-Windsor area in cooperation with Canadian and local authorities. Air samples have been collected and some of the pollutants analyzed. Efforts are being made to assess the economic effects of air pollutants, the effects on plant growths, and on people in the area.

Samples of particulate impurities—solid and liquid matter—in air are being collected in 23 communities in the United States and Alaska and sent to the Center for study. The materials are analyzed for inorganic and organic content, possible allergenic substances, and radioactivity. This study is expected to result in improved techniques for collection and analysis. It will also provide information on the roles of weather, climate, geography and dominant types of human activity in the creation of local air pollution hazards.



High volume air samplers used in the study of air pollution. Particulate matter is filtered from the air as it is drawn through the fiberglass mat on the front of the sampler. The material is analyzed for organic and inorganic constituents and for its radioactivity level.

Gases and vapors are perhaps even more difficult than particles to collect and analyze. The development of apparatus and techniques for this work will be an important project of the near future.

The Center is exploring possible indices of the effects of air pollution on the health of man by detailed statistical analyses of variations in recorded death rates in relation to meteorological cycles usually associated with air pollution. Methods for assessment of the effects of air pollutants on man are most urgently needed.

Above: Location of 23 communities where comparative study of air pollution under different conditions of climate and topography is being made.

Right: Laboratory work is an important part of each training course at the Center. Here trainees are gaining a working knowledge of analytical techniques.

TECHNICAL SERVICES

Training

The training program of the Sanitary Engineering Center is designed to give practical, up-to-date knowledge and techniques to professional people from Federal, State and local agencies and industrial groups. Intensive 3-day to 3-week courses are offered throughout the year. They are conducted by a full-time staff of specialists. The Center's research and survey experts are available for special assistance as needed. Every course calls for laboratory work, and the Center is equipped with especially designed training laboratories, classrooms and modern teaching aids.

The courses grouped under the heading, "Advanced Sanitation Training," range from highly specialized subjects like "Short Course in the Analyses of Metals in Industrial Wastes," to courses covering

a relatively broad area, such as "Advanced Training for Sanitary Engineers in Water Pollution Abatement Programs." Workers in almost every phase of environmental health will find at least one course which aids them professionally. The Radiological Health Training program includes intensive courses in principles of radiological health, environmental radiation sanitation, and occupational radiation protection, plus short courses for technical specialists such as waterworks personnel, conducted by a separate staff of radiological training experts.

Consultant Services

In addition, the Center offers consultant services to States or other agencies wishing to set up their own training programs; very often, one man trained at the Center will in turn train many others, thus extending the coverage many-fold.

The Center and its staff act as consultants to State health departments and other agencies on many types of technical problems. For example, staff members of the Center, on request, review and evaluate the sanitation laboratory practices of State and local health personnel. This program, over the years, has done much to establish uniform standards for examination of water, milk and foods. The Center renders emergency aid on such problems as that which confronted city health officials of Clarksburg, West Va., when a large fire at an industrial warehouse caused chemicals to drain to the source of public water supply.

Engineering Abstracts

The Center publishes "Public Health Engineering Abstracts," a monthly compilation of short summaries of current literature in the environmental health field. Other publications of the Center include reports, guides and handbooks, and technical articles. Individual scientists at the Center present papers before scientific and technical meetings, and many of them are later published in scientific journals.

State and local health personnel discuss the chemistry of ionizing radiations as related to public health in a typical seminar session of the Center's training program. About 20 courses are scheduled each year in Cincinnati with attendance limited to 10 to 25 public health workers. Additional courses are given in the field in cooperation with State agencies and academic institutions.

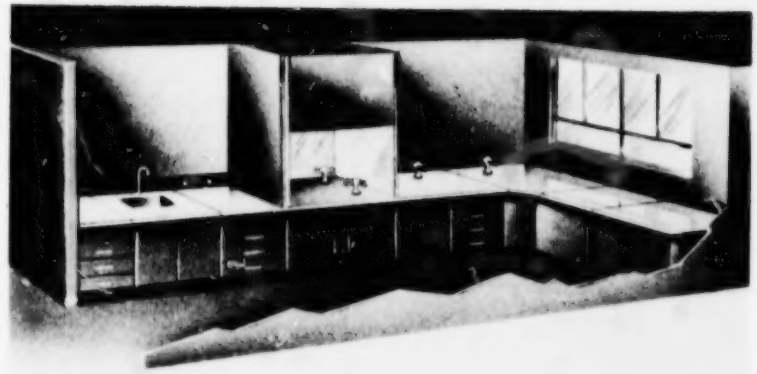
Facilities of The Center

The new modern building in Cincinnati houses the headquarters and base laboratories of the Sanitary Engineering Center. The major part of its 159,000 square feet of floor space is devoted to laboratory units. The design is functional and flexible; interior walls bear no load and can therefore be moved easily to meet changing needs. Special rooms at the Center include animal quarters, instrument rooms, a reference library and a lecture hall. A separate air supply and exhaust system is provided for the animal quarters. Facilities for water and sewage treatment studies are provided by an experimental wing, 3,600 square feet in area, equippd with a 5-ton overhead crane with 37 feet of head room. Water from the Little Miami River and Cincinnati city sewage will be pumped into this wing for pilot plant scale studies.

Special constant temperature rooms are provided for microbiology, chemistry and aquatic biology laboratories. Relatively "high" and "low" level radio-chemistry operations are segregated; access to this section is through a "change room" where laboratory clothes are changed.

Among the major items of heavy physical equipment housed in special instrument rooms are the electron microscope, emission spectrograph, electrophoresis apparatus, refrigerated ultra-centrifuge, ultra-sonorator, and many others.

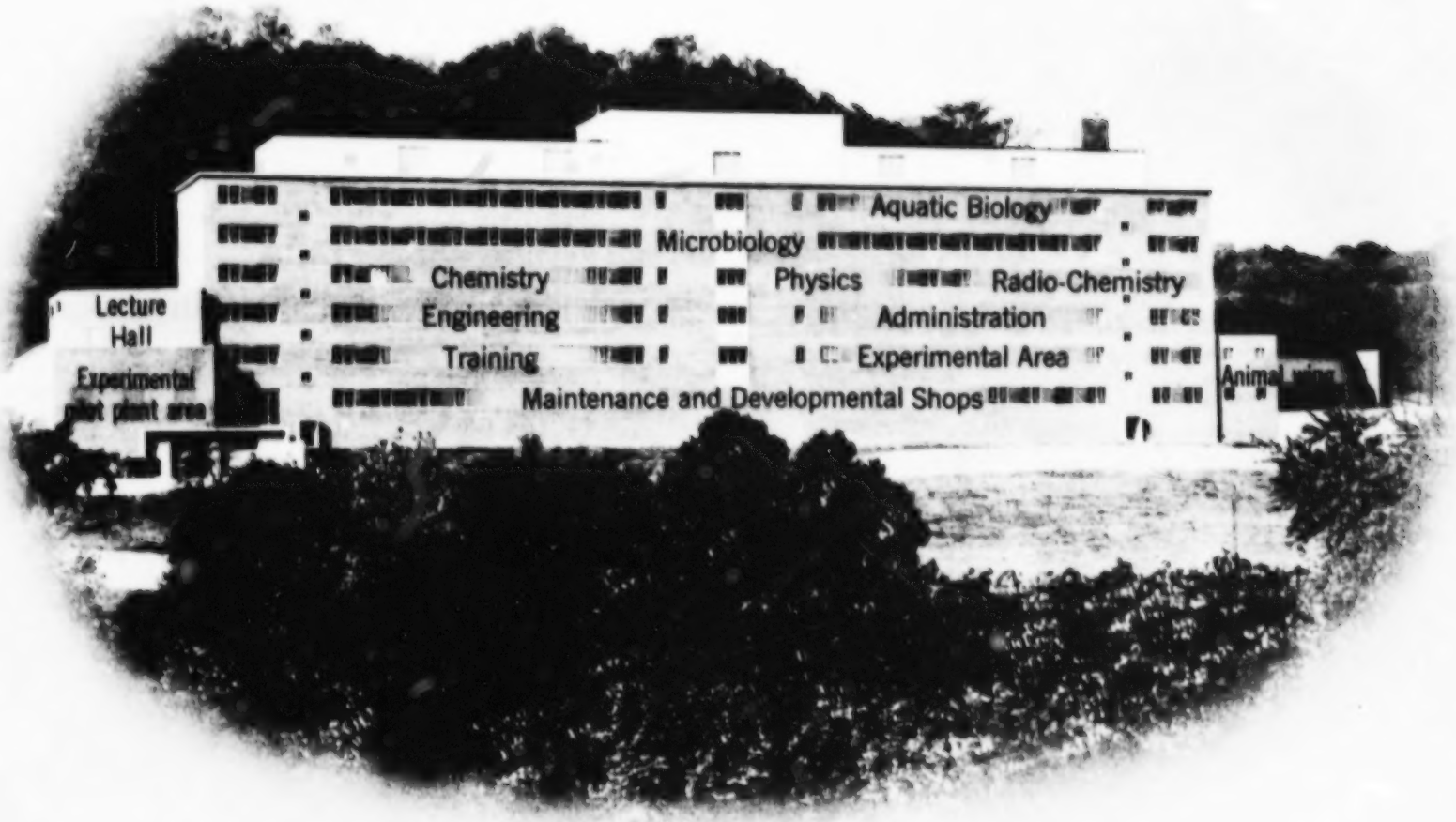
In addition to the activities in the main building, the Center currently operates four field stations for projects which can be undertaken more effectively away from Cincinnati. Part of the research on radioactive waste disposal is done at laboratories in Oak Ridge, Tennessee, and Los Alamos, New Mexico. Studies of shellfish sanitation are carried out at Pensacola, Florida, and research on toxicity in relation to fish at Corvallis, Oregon. Ten mobile laboratory units mounted in trailers are available for use wherever they are needed.



STANDARD LABORATORY UNIT

The laboratory building is arranged on a modular plan of repeated standard laboratory units, each about 12 feet by 18 feet in size. Each unit contains basic laboratory equipment which is augmented by special apparatus according to the needs of the particular project under way.

Utility services are provided on both sides of the central corridor, with access panels in each laboratory unit. The utilities provided include hot and cold water, compressed air, gas, vacuum, electricity (110 volt and 220 volt), steam, and drains which are resistant to acid wastes. Distilled water from a central plant is piped to an outlet on each floor. A separate air supply and exhaust system is provided for the "purged" type hoods in selected locations.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Chemistry
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Lecture Hall
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Administration
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Experimental Area
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